Abstract of the thesis presented to the Senate of Universiti Putra Malaysia in fulfillment of the requirement for the degree of Master of Science

DESIGN AND DEVELOPMENT OF HIGH SENSITIVITY ERBIUM DOPED FIBER AMPLIFIER

By

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December 2003

Chairman: **Associate Professor Mohamad Khazani bin Abdullah, Ph.D.**

Faculty: **Engineering**

Various aspects concerning Erbium Doped Fiber Amplifiers (EDFA) for use in C-band transmission system were investigated through experimental work culminating in the design and implementation of three different C-band EDFA's. The most promising being an EDFA utilizing double pass with tunable bandpass filter (TBF) amplification scheme. The configuration is a new approach to increase the sensitivity of the preamplifier before the signal is received by the receiver. This is because, limited sensitivity preamplifiers offered in the markets that limit the fiber optic link design. Thus, a new approach is desirable in solving the problem. In this thesis, new technique is proposed to increase the sensitivity up to 10dB.

STM-1 and STM-4 Bit Error Rate (BER) test on SDH network was successfully conducted in a laboratory environment. The test showed that no error was introduced. Finally it is concluded that DPEDFA is reliable to be used as a device to realize high sensitivity preamplifier, as its realization would result in a huge increase in additional power budget with minimum installation and maintenance complexity and cost.

Abstrak tesis yang dikemukakan kepada Senat Universiti Putra Malaysia sebagai memenuhi keperluan untuk ijazah Master Sains

REKABENTUK DAN PEMBINAAN PENGUAT GENTIAN BERDOPAN ERBIUM BERSENSITIVITI TINGGI

Oleh

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Beberapa aspek melibatkan Penguat Gentian Berdopan Erbium bagi kegunaan didalam system penghantaran jalur C, disiasat melalui eksperimen – dimana ia melibatkan rekabentuk dan penerapan tiga jenis EDFA jalur C yang berbeza. Diantaranya, yang paling baik ialah EDFA menggunakan skim penggandaan laluan berganda dengan penuras jalur lepas boleh ubah. Konfigurasi ini adalah satu penemuan baru dalam meningkatkan kesensitifan pra-pengganda sebelum isyarat diterima oleh penerima. Ini adalah disebabkan pra-penganda yang kini berada didalam pasaran mempunyai kesensitifan yang terhad yang menyebabkan penghadan dalam rekabentuk talian fiber optik. Maka, satu kaedah baru diperlukan untuk menyelesaikan masalah ini. Dalam disertasi ini, satu teknik baru dicadangkan untuk meningkatkan kesensitifan sehingga 10dB.

Ujian STM-1 dan STM-4 di dalam rangkaian SDH juga telah berjaya dijalankan di persekitaran makmal menunjukkan tiada kesilapan berlaku. Akhir sekali disimpulkan bahawa DPEDFA mampu digunakan untuk merealisasi pra-pengganda bersensitiviti tinggi dan membuka jalan kepada peningkatan bajet kuasa dengan kerumitan dan kos pemasangan serta penjagaan yang minimum.

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I certify that an Examination Committee met on 30th September 2003 to conduct the final examination of Rosdisham bin Endut on his Master of Science thesis entitled "Design and Development of High Sensitivity Erbium Doped Fiber Amplifier" in accordance with Universiti Pertanian Malaysia (Higher Degree) Act 1980 and Universiti Pertanian Malaysia (Higher Degree) Regulations 1981. The Committee recommends that the candidate be awarded the relevant degree. Members of the Examination Committee are as follows:

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DECLARATION

I hereby declare that the thesis is based on my original work except for the quotations and citations, which have been duly acknowledged. I also declare that it has not been previously or concurrently submitted for any other degree at UPM or other institutions.

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